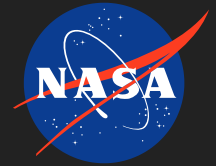


# Fault-Protected Laser Diode Drivers for Improving the Performance and Lifetime of Multiple-Millisecond, Long-Pulse LDAs for NASA

## LIDAR Systems, Phase I

Completed Technology Project (2006 - 2006)



### Project Introduction

This SBIR project will develop and deliver revolutionary driver technology with intelligent fault protection for driving long-pulse ( $> 2\text{msec}$ ), quasi-CW laser diode arrays (LDAs) at high power with improved performance and lifetime. A critical issue with operating LDAs for long discharge pulses is localized diode heating leads to current and optical instabilities, which irrevocably damage emitters resulting in LDA failure. SRL has demonstrated that diode instabilities can be detected and eliminated. As a result, integrating SRL's proprietary fault diagnostics into diode drivers increases laser diode lifetimes by more than a factor-of-40 over unprotected drivers. In addition, in Phase 1, SRL will acquire data demonstrating that our fault-mode circuitry can be used as a diagnostic to a priori determine which LDA's will have long lifetimes. In Phase 2 we will deliver a fully engineered compact driver for powering NASA LDAs and screening their suitability for use in flight hardware. The Phase 2 driver will have specific power ratings up to 7 kW/liter, which is 4 times higher than existing laser diode drivers. The combination of fault diagnostics for increased laser diode performance and lifetime and compact packaging, makes the SRL driver an important technology for powering LDAs for NASA flight systems.

### Anticipated Benefits

Potential NASA Commercial Applications: Initially the customers for the government market will be system providers for NASA and the DoD. From SRL's discussions with Boeing and Northrop Grumman, we estimate the market size will be small initially as these two organizations are in the process of delivering pre-prototypes and prototypes. The BAE Systems market is more established and, starting in 2008, they plan to deliver approximately 100 laser systems annually that will integrate SRL's fault protected technology. SRL expects to sell drivers for \$10,000 per unit that gives a total market of approximately a million dollars annually. This market is expected to increase by 20% annually as SRL's power supplies are integrated into additional systems and Boeing and Northrop Grumman prototypes become NASA and DoD hardware. The private sector market is \$3.2 billion annually and is interested in LDAs pumping solid-state lasers for communications, industrial welding and cutting, and advanced lithography EUV sources.



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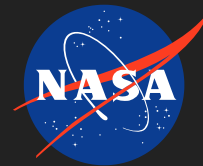
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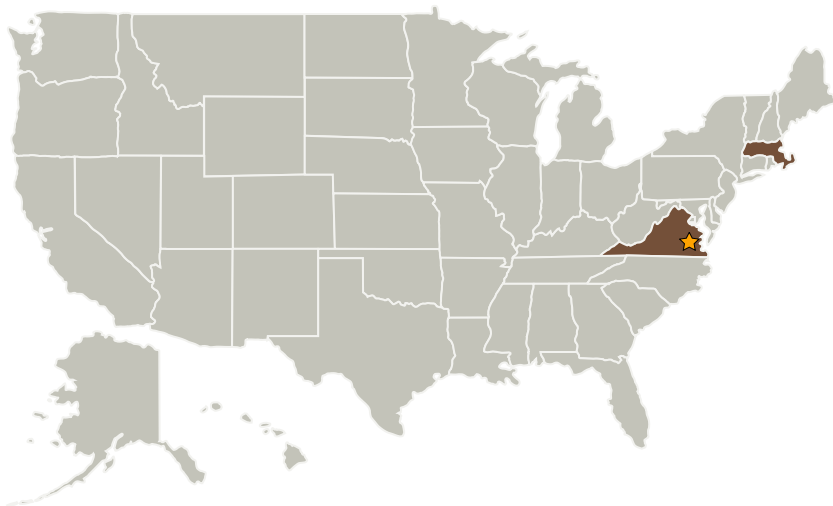
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### Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Science Research Laboratory, Inc.	Supporting Organization	Industry	Somerville, Massachusetts

### Primary U.S. Work Locations

Massachusetts	Virginia
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### Organizational Responsibility

#### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

#### Lead Center / Facility:

Langley Research Center (LaRC)

#### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

### Project Management

#### Program Director:

Jason L Kessler

#### Program Manager:

Carlos Torrez

#### Principal Investigator:

Rodney Petr

### Technology Areas

#### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
  - └ TX08.1.5 Lasers